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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/991,460	11/16/2001	Robert G. Batchko	020882-000110US	3772
20350	7590	12/15/2003	EXAMINER	
TOWNSEND AND TOWNSEND AND CREW, LLP			LEE, JOHN D	
TWO EMBARCADERO CENTER			ART UNIT	
EIGHTH FLOOR			PAPER NUMBER	
SAN FRANCISCO, CA 94111-3834			2874	

DATE MAILED: 12/15/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/991,460

Applicant(s)

BATCHKO, ROBERT G.

Examiner

John D. Lee

Art Unit

2874

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-84 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 7-9, 11-31, 33-58 and 60-62 is/are allowed.
- 6) ☒ Claim(s) 1-3, 5, 10, 32, 59, 63, 64 and 67-84 is/are rejected.
- 7) ☒ Claim(s) 4, 6, 65 and 66 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

(abstract)

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 November 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). ____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 0602 6) ☐ Other: ____

Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e) based on provisional U.S. Application Serial Number 60/249,569, filed November 16, 2000, and provisional U.S. Application Serial Number 60/281,148, filed April 2, 2001.

The drawings are objected to because some of the lines therein are thin and non-uniform; some of the labeling therein is handwritten and thus hard to perceive; and some of the legends appear to interfere with the drawings themselves (e.g. Figure 9). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

The abstract of the disclosure is objected to because of the following informalities. The present abstract is too long (current Rules limit the abstract to a maximum of 150 words) and it is not in the form of a single paragraph. Also, in the ninth line of the text, the word "in" should actually be "is". Correction is required. See MPEP § 608.01(b).

The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claims 47, 55, and 79 are objected to because of the following minor informalities: in claim 47, line 1, the word "or" should be inserted after "one"; in claim 55, one of the two periods at the end of the claim should be deleted; and in claim 79,

line 4, the word "to" should be inserted after "beams". Appropriate correction is required.

The following is a quotation of the second paragraph of 35 U.S.C. § 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 10, 32, 59, 67-72, 81, and 83 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In claim 10, line 2, there is no antecedent support for "said plurality of signal frequencies", thus rendering the claim indefinite. It is believed that this claim should actually depend from claim 8 rather than from claim 7. In claims 32 and 59, line 2 of each, there is no antecedent support for "said signal pump channel" because of the word "pump". The claims are thus indefinite. In claim 67, lines 1-2, there is no antecedent support for "said first converter stage" because of the word "stage"; and in claim 68, lines 1-2, there is no antecedent support for "said second converter stage" because of the word "stage". The claims are thus indefinite. The same lack-of-antecedent problem exists in claims 69-72, thus rendering them indefinite. The word "stage" should be deleted from line 2 of each of claims 69-72. In line 1 of each of claims 81 and 83, the term "said step of performing a translation" is unclear (and the claims are accordingly indefinite) because this term could refer to either the *first* translation, the *second* translation, or *both* the first and second translations.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3, 5, 63, 64, 76-81, 83, and 84 are rejected under 35 U.S.C. § 102(b) as being clearly anticipated by U.S. Patent 5,940,418 to Shields. Shields discloses a cascaded, plural stage, optical frequency shifter capable of performing all-optical frequency translation (see especially Figures 1A-1H). In some of the embodiments disclosed by Shields, each stage is a three-wave nonlinear mixing crystal in which nonlinear optical interactions are achieved between two input optical waves (i.e. a pump frequency and a signal frequency) and an intermediate channel having an intermediate frequency. In each case, the input signal frequency is clearly differentiated from the converted output frequency. The stages and the channels thereof in Shields are all optically coupled together. The three-wave nonlinear mixing crystals in Shields perform

second-order nonlinear optical interactions. Notice that the embodiments of Shields incorporating a plurality of cascaded three-wave nonlinear mixing crystals (Figure 1) clearly show the optical wavelengths of the various waves. The embodiments of applicant's claims 76-78, 80, 81, 83, and 84 is readily apparent therein. Notice that Shields uses beamsplitters to split the beams between the various stages (Figures 2, 3, 5, 6, etc.).

Claims 1-3, 5, 63, 64, and 69-72 are rejected under 35 U.S.C. § 102(b) as being clearly anticipated by U.S. Patent 5,233,462 to Wong. Wong discloses a cascaded, plural stage, optical frequency shifter capable of performing all-optical frequency translation (see, for example, Figure 8). In Wong, each stage is a three-wave nonlinear mixing crystal (OPO) in which nonlinear optical interactions are achieved between two input optical waves (i.e. a pump frequency and a signal frequency) and an intermediate channel having an intermediate frequency. In each case, the input signal frequency is clearly differentiated from the converted output frequency. The stages and the channels thereof in Wong are all optically coupled together. The three-wave nonlinear mixing crystals (OPO's) in Wong perform second-order nonlinear optical interactions (i.e. optical parametric oscillation, sum frequency generation, and difference frequency generation). Notice that Wong also discloses the use of acousto-optic and electro-optic modulators (frequency shifters) in the patented device.

Claim 75 is rejected under 35 U.S.C. § 102(b) as being clearly anticipated by U.S. Patent 6,016,214 to Meyer, Jr. et al. Meyer, Jr. et al discloses an optical frequency shifter, capable of performing all-optical frequency translation, comprising a quasi-

phase-matched nonlinear optical material having a spatially distributed effective nonlinearity d_{eff} . The Meyer, Jr. et al device is designed specifically as an optical parametric oscillator (OPO), which means that there are at least two input optical waves to the device. The input waves, which are quasi-phase-matched by the nonlinear optical material, can be considered as first and second pump waves.

Claims 73 and 74 are rejected under 35 U.S.C. § 102(e) as being clearly anticipated by U.S. Patent 6,181,463 to Galvanauskas et al. Galvanauskas et al discloses an optical frequency shifter, capable of performing all-optical frequency translation, comprising a two-stage quasi-phase-matched optical nonlinear crystal device (see Figure 4(c)). The QPM nonlinear crystals of Galvanauskas et al perform optical frequency mixing (e.g. difference frequency mixing).

Claim 82 is rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 5,940,418 to Shields. Shields does not disclose the specific pump frequency relationship set forth in this claim, but the various numerical values (for input pump frequencies) shown in the cascaded arrangements of Figures 1A-1H of the reference would have made the claimed relationship obvious to a person of ordinary skill in the art. These Figures show that many, many wavelength (frequency) combinations can be employed to generate various converted wavelengths (frequencies).

Claims 7-9, 11-31, 33-58, and 60-62 are allowed. None of the prior art of record discloses or reasonably suggests the optical frequency shifter based on cascaded quasi-phase-matching structures set forth in these claims. For the same reason, claims

10, 32, and 59 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. § 112, second paragraph, set forth in this Office action.

Claims 4, 6, 65, and 66 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. As mentioned in the immediately preceding paragraph, the prior art of record does not disclose or reasonably suggest the optical frequency shifter based on cascaded quasi-phase-matching structures set forth in claims 4 and 6. With respect to claims 65 and 66, the prior art of record (particularly Shields and Wong) does not disclose or reasonably suggest the simultaneous plural channel conversion arrangement set forth herein.

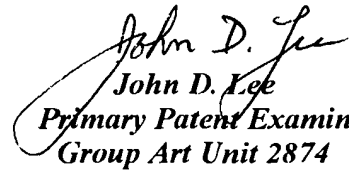
The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Patent 6,005,878 to Kung et al and U.S. Patent 6,282,014 to Long are cited to show other optical frequency shifters utilizing a plurality of second-order nonlinear optical crystals.

All of the U.S. Patents listed on the first page of applicant's Information Disclosure Statement filed on June 11, 2002, have been considered and made of record (note the attached initialed copy of form PTO-1449). It is noted that this page is labeled "Sheet 1 of 2"; however no page 2 of this IDS has been found in the file.

Any inquiry concerning the merits of this communication should be directed to Examiner John D. Lee at telephone number (703) 308-4886. The Examiner's normal work schedule is Tuesday through Friday, 6:30 AM to 5:00 PM. Any inquiry of a general or clerical nature (i.e. a request for a missing form or paper, etc.) should be directed to

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the Technology Center 2800 receptionist at telephone number (703) 308-0956, to the technical support staff supervisor (Team 2) at telephone number (703) 308-3072, or to the Technology Center 2800 Customer Service Office at telephone number (703) 306-3329.


John D. Lee
Primary Patent Examiner
Group Art Unit 2874